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Brief 70-10133

NASA TECH BRIEF

A Program for Computing Shock-Tube Gas Dynamic Properties

The problem:

Investigations of atomic and molecular phenomena utilizing shock tubes, as well as studies of the feasibility of planetary entry at high velocities, have created a need for rapid solution techniques for aerothermochemistry problems involving the high-temperature properties of gas mixtures.

The solution:

A computer program for calculating the chemical equilibrium properties associated with moving, standing, and reflected normal shocks.

How it's done:

The program calculates thermodynamic properties and chemical composition from basic spectroscopic data. The initial gas mixture, temperature, and pressure can be easily varied. The program can treat initial mixtures consisting of up to ten gases. Both dissociation and ionization over an unlimited temperature range can be considered. The computational capacity of the program is a mixture of 100 different species composed of ten different elements. These numbers are limited only by the initial dimension statement and can be increased, provided computer storage is available.

The output is a complete thermodynamic and chemical description of the gas. This satisfies the Hugoniot equation for the important normal shock cases that are useful in both shock-tube experimentation and free-flight entry calculations. The program can also be used to generate Mollier thermodynamic data at selected temperatures and densities.

Notes:

1. This program will be useful to persons working with shock tubes and other types of high-temperature devices.
2. This program is written in FORTRAN II for use on the IBM 7090/94 computer.
3. Inquiries should be made to:

   COSMIC
   Barrow Hall
   University of Georgia
   Athens, Georgia 30601
   Reference: B70-10133

Patent status:

No patent action is contemplated by NASA.

Source: T. E. Horton and W. A. Menard of Caltech/JPL under contract to NASA Pasadena Office (NPO-11068)

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